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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Application Number: 10/817,417
Filing Date: March 30, 2004
Appellant(s): YUE ET AL.



E. Rico Hernandez
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed December 26, 2006 appealing from the Office action mailed June 20, 2006.

Note : The Examiner's Answer is in responses to the remand of October 31, 2007 (order returning undocketed appeal to examiner) from BPAI. The amendment filed December 22, 2006 has been considered by the examiner (December 5, 2007).

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal no longer involve claim 8 since it was canceled (the amendment filed December 22, 2006).

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect. The appellant's amendment after final (December 22, 2006) has been entered (December 5, 2007).

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct except as to claim 8, which is now canceled.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is substantially correct. Claim 8 is cancelled since the appellant's amendment after final (December 22, 2006) has been entered (December 5, 2007).

**(8) Evidence Relied Upon**

| | | |
|---|---|---|
| 2004/0185583 | Tomoyasu et al. | 9-2004 |
| 2004/0097047 | Natzle et al. | 5-2004 |
| 2004/0241981 | Doris et al. | 12-2004 |

Wadsworth,H.M."Handbook of statistical methods of engineers and scientists" chapter 18, pp 18.1-18.5.

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Tomoyasu teaches that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. The feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu teaches varying flow rates of HF, $NH_3$, and argon. Tomoyasu also teaches varying pressure, and temperature. Tomoyasu teaches treating a silicon oxide feature. See abstract; [0007], [0059]-[0064], [0074], [0200].

Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collections in various process conditions, it would have been obvious to one with ordinary skill in the art to apply commonly used engineering calculation, curve fitting techniques and statistical tools to determine and cure fit the relationship between trim time and trim amount. As such, log relationship (e.g., claims 1 and 9) would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Claims 1, 4-6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047) as evidenced by Wadsworth (Handbook of statistical methods for engineers and scientists).

In a method for removing chemical oxide on a substrate, Natzle teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant and a second reactant. Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as, time, temperature, composition, residence time, pressure of the reactant, the amount of reactant or the rate of reactant), all of which can be regulated. Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed. Therefore, it would have been obvious to one with ordinary skill in the art that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim

amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. Natzle teaches that the feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Natzle teaches varying flow rates of HF, $NH_3$, pressure, and temperature. See [0014] [0037] [0038] [0042]-[0044].

As to dependent claim 6, Natzle teaches treating a silicon oxide feature, see [0014].

After gathering information of etching rates, thickness (trim amount) as function of time, process parameters) in various process conditions, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation). As such, log relationship (e.g., claims 1 and 9), would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Claim 5 differs from Natzle by specifying well-known features (such as adding inert gas of argon to the etchant as a process gas and determining the effect on the etching) to the art of semiconductor device fabrication, the examiner takes official notice. It is the examiner's position that a person having ordinary skill in the art at the

time of the claimed invention would have found it obvious to incorporate inert gas to same in order to provide their art recognized advantages and produce an expected result with a reasonable expectation of success.

It is noted that appellants did not traverse the aforementioned conventionality (e.g., well-known features and common knowledge), which have been stated in the previous office action (January 10, 2006).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle as applied to claim 1 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle from above is repeated here.

Natzle is silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

**(10) Response to Argument**

Appellants have argued that Tomoyasu does not teach fitting the trim amount data as the function of time with a log relationship. It is not persuasive. As has been stated in the office action, Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collections in various process conditions, it would have been obvious to one with ordinary skill in the art to apply commonly used engineering calculation, curve fitting techniques and statistical tools to determine and cure fit the relationship between trim time and trim amount. As such, log relationship would have been expected in some results when using various process conditions. See

also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have argued that there is no motivation or suggestion to apply commonly used curve fitting techniques and statistical tools to determine the relationship between trim time and trim amount. It is not persuasive. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Performing engineering calculation such as curve fitting techniques and statistical tools is the knowledge generally available to one of ordinary skill in the art (basic course requirement for undergraduate engineering). See example of Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have argued that Natzle does not teach fitting the trim amount data as the function of time with a log relationship. It is not persuasive. As stated in the office action, after gathering information of etching rates, thickness (trim amount) as function of time, process parameters) in various process conditions, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and

perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation). As such, log relationship would have been expected in some results when using various process conditions. See also statistical tool of non-linear regression in Wadsworth (Handbook of statistical methods for engineers and scientists) as evidence. Wadsworth shows the way to curve fit experimental data in log relationship or exponential relationship.

Appellants have also argued that there is no motivation or suggestion to apply commonly used curve fitting techniques and statistical tools to determine the relationship between trim time and trim amount. It is not persuasive. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Performing engineering calculation such as curve fitting techniques and statistical tools is the knowledge generally available to one of ordinary skill in the art . See example of Wadsworth (Handbook of statistical methods for engineers and scientists, chapter 18, 18.1-18.5) which shows the way to curve fit experimental data in log relationship or exponential relationship.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Kin-Chan Chen
Primary Examiner
Art Unit 1792

December 6, 2007

Conferees:

Nadine Norton

for Jennifer Kolb-Michener